## Lodgepole Pine

James W. Bartolome

## Vegetation

**Structure--** Lodgepole pine typically forms open stands of similarly sized specimens in association with few other species and with a sparse understory (Rundel et al. 1977). On fertile sites, trees can reach a height of 40 m (130 ft), but typically a stand consists of groups averaging 15 to 20 m (40 to 65 ft) in height. Nine stands in Sequoia National Park (Van Kat and Major 1978, cited in Rundel et al. 1977) averaged 56 percent crown cover, 3390 trees per ha (1370 per ac), and 58 sq m (625 sq ft) of basal area per ha (2.5 ac). Mature Sierran stands often contain significant seedlings and saplings, in contrast to the even aged character of stands in the northern Cascades and Rocky Mountains (Critchfield 1980).

Composition-- Lodgepole pine overwhelmingly dominates the habitat. Occasional associates include aspen and mountain hemlock. The amount of understory is weakly correlated with overstory density (Bartolome 1983). The understory may be virtually absent, consisting of scattered shrubs and herbs, or a rich herbaceous layer at meadow margins. Many lodgepole stands are associated with meadow edges and streams, where the understory consists of grasses, forbs, and sedges. In the southern Sierra and mountains of southern California, understory shrubs such as huckleberry and mountain heather may be common (Cheatham and Haller 1975).

Other Classifications-- Lodgepole Pine habitats form an easily distinguishable subdivision of the mixed conifer forest. Other classifications are Lodgepole Pine (U.S. Forest Service 1981) and Lodgepole Forest (Munz and Keck 1949). Classifications based on potential vegetation may not include a lodgepole pine type, considering it successional to other forest types.

### Habitat Stages

**Vegetation Changes--** 1;2-5:S-D. Three major disturbances affect lodgepole pine in California: fire, insects, and logging. These disturbances create openings of various sizes that lodgepole pines rapidly recolonize (Lotan and Perry 1983). The stages of vegetation change are primarily the result of increased tree density, canopy cover, and size.

A short period of herbaceous productivity precedes closure of the tree canopy on productive sites. The prolific seed output, establishment, and seedling growth of

lodgepole pine makes the period of herbaceous production short.

Continued recruitment into stands produces overstocking and slow growth of the overcrowded trees. This overcrowding may make them susceptible to insects (Lotan and Perry 1983), although others have argued that the more vigorously growing trees are more likely to be attacked. Beetle infestation creates large quantities of fuel that increase the probability of wildfire.

Many Sierran meadows have been invaded over the last few centuries by lodgepole pine (Benedict 1982); creating new dense stands. Although the understory persists, productivity is lowered (Bartolome 1983). The causes of this invasion remain poorly understood. Repeated episodes of tree invasion and subsequent reestablishment of meadows have occurred since the most recent glaciation.

**Duration of Stages--** Young pines establish very rapidly and become reproductive; five year-old lodgepole pines are capable of producing cones (Critchfield 1980). Within 20 years, the canopy closes and understory productivity becomes negligible (Basile 1975 (Not in Hab Lit Cite)). Duration of the type thus depends on subsequent longevity of the trees. Stand persistence appears inversely related to site productivity (Lotan and Perry 1983); highly productive sites in Washington and Idaho were reported to start losing trees at 80 to 100 years. The upper limit of tree age seems about 400 years, although Critchfield (cited in Rundel et al. 1977) estimated one tree in the Sierra to be at least 600 years old.

### **Biological Setting**

**Habitat--** Typically the lodgepole pine zone is found above red fir and below the other subalpine conifer habitats (Rundel et al. 1977). Although the boundaries between lodgepole pine and meadow are dynamic, they are easily differentiated in classification of the existing landscape. Lodgepole pine most closely associates with the red fir habitat of lower elevations. Although lodgepole pine is widespread, it is generally a minor forest element in other habitats. At the upper elevation limits of lodgepole pine in southern California, the trees may adjoin alpine habitats.

Wildlife Considerations-- Lodgepole pine stands have low structural diversity and are relatively low in animal species. Many species found in lodgepole pine stands are associated with the meadow edge. The Lodgepole habitat provides suitable habitat for 6 reptiles and amphibians, 49 birds, 35 mammals (Verner and Boss 1980). These species include wolverine (rare), goshawk (sensitive), bald eagle (endangered), and prairie falcon (sensitive).

### **Physical Setting**

Lodgepole pine occupies an array of landscape units within its zone of adaptation.

Areas of lodgepole pine in the red fir habitats are characterized by poor drainage and often a cooler microsite. Lodgepole pine is commonly associated with meadows (Rundel et al. 1977). Although lodgepole pine has well developed water regulation mechanisms, it typically occupies areas with at least seasonally wet soils. Annual precipitation in the lodgepole pine zone averages from 750 to 1000 mm (30 to 40 in) annually, mostly as snow. The growing season is short, averaging 2 to 3 months (Rundel et al. 1977).

#### Distribution

Lodgepole Pine habitats are scattered throughout the state, but concentrated in the Sierra Nevada and southern Cascades. Significant stands, however, occur in the higher mountains of southern California (Griffin and Critchfield 1972). Well developed lodgepole pine habitats are found above 1800 m (5900 ft) elevation in the northern Sierra and above 2400 (7900 ft) in the south.

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Sierran Mixed Conifer Updated by: CWHR Staff, April 2005

Barbara H. Allen

## Vegetation

**Structure**. The Sierran mixed conifer habitat is an assemblage of conifer and hardwood species that forms a multilayered forest. Historically, burning and logging have caused wide variability in stand structure, resulting in both even-aged and unevenaged stands (Rundel et al. 1977). Virgin old-growth stands where fire has been excluded are often two-storied, with the overstory comprised of mixed conifer and the understory white fir and incense-cedar (Tappeiner 1980).

Forested stands form closed, multilayered canopies with nearly 100 percent overlapping cover (Rundel et al. 1977). When openings occur, shrubs are common in the understory (Kosco 1980). Closed canopy stand distribution is both extensive and patchy depending on scale, site, slope, soils, microclimate, and history.

At maturity, the dominant conifers range from 30 to 60 m (100 to 200 ft) tall with a highly variable basal areas of about 17 to 26 sq m (180 - 280 sq ft). Diameter breast height at maturity for pines and Douglas-fir is commonly greater than 1 m (40 in); white fir greater than 0.9 m (35 in) is common (Laake and Fiske 1983b). Fuel loading in stands heavy with pine may reach 27,000 kg/ha (70 to 80 t/ac) in natural stands; whereas fuel loading in stands heavy with fir may reach 16,000 kg/ha (40 to 50 t/ac).

Composition. Five conifers and one hardwood typify the mixed conifer forest white fir, Douglas-fir, ponderosa pine, sugar pine, incense-cedar, and California black oak. White fir tends to be the most ubiquitous species (though most often a minor overstory component) because it tolerates shade and has the ability to survive long periods of suppression in brush fields Douglas-fir dominates the species mix in the north, but is absent south of the Merced River (Tappeiner 1980). Ponderosa pine dominates at lower elevations and on south slopes. Jeffrey pine commonly replaces ponderosa pine at high elevations, on cold sites, or on ultramafic soils (Rundel et al. 1977). Red fir is a minor associate at the highest elevations. Sugar pine is found throughout the mixed conifer type. Black oak is a minor, but widespread, component in mixed conifer stands. Though black oak does best on open sites, it is maintained under adverse conditions such as shade, ridge tops, and south slopes where conifers may regenerate in its shade (Tappeiner 1980). In the central and particularly southern Sierra Nevada, giant sequoia is a striking associate of the mixed conifer type (Rundel et al. 1977). White fir, incense-cedar and sugar pine are associated with the mesic giant sequoia sites (Tappeiner 1980).

Deerbrush, manzanita, chinquapin, tan oak, bitter cherry, squawcarpet, mountain whitethorn, gooseberry, rose, and mountain misery are common shrub species in the mixed conifer understory (Kosco and Bartolome 1983). Grasses and forbs associated with

this type include mountain brome, Carex, bull thistle, iris, Juncus, and needlegrass. In all, over 100 species of grasses, forbs and shrubs contribute to the flora of the mixed conifer habitat (Tappeiner 1980).

Other Classifications.- Other names for the Sierran mixed conifer habitat include yellow pine forest (Munz 1973). Parker and Matyas (1981) divide Sierran mixed conifer into five series: mixed conifer-fir, mixed conifer-pine, ponderosa pine, white fir and Jeffrey pine. Rundel et al. (1977) describes the mixed conifer as part of a White fir-mixed conifer forest and Cheatham and Haller (1975) call this habitat Sierran coniferous forest (8.42), a major subdivision of the lower montane coniferous forest habitat (8.4). Sierran mixed conifer is SAF type 243 (Tappeiner 1980). Where ponderosa pine or Douglas-fir predominates without significant amounts of white fir or incense-cedar, the forest is typed as Pacific ponderosa pine or Pacific ponderosa pine-Douglas-fir (SAF types 245 and 244, respectively) (McDonald 1980).

### Habitat Stages

**Vegetation Changes** 1;2-5:S-D;6. After logging or burning, succession proceeds from an ephemeral herb to perennial grass-herb, through a shrub-perennial grass stage, to conifers (Burcham 1964). In many areas, however, shrubs appear in the first year after disturbance (Kosco 1980). The habitat stages are stage 1, grass-forb, with bedstraw, plantain, mountain brome, and needlegrass as common early succession species; stage 2, shrub-seedling-sapling, characterized by manzanita, Ceanothus, cherry, gooseberry, and mountain misery. In the seedling tree stage through the sapling tree, pole tree, small tree, and medium/large tree stages, the five conifers gain dominance of the site.

**Duration of Stages**. Stage duration has been described by Verner (1980). The grassforb stage, generally is short-lived (less than 2 years). The shrub-seedling-sapling stage is usually evident by yr 2 and lasts 10 to 40 yr; this stage is a mixture of shrubs and saplings up to 6 m (20 ft) tall depending on the site, degree, and type of disturbance. If tall shrubs capture the site, it may take 10 to 15 plus yr for trees to dominate the site. The polemedium tree stage supports trees up to 15 m (50 ft) tall and may last from 15 to 90 yr on poor sites. The mature and overmature stages include stands greater than about 30 m (100 ft) in height.

## **Biological Setting**

**Habitat**. The type adjoins Ponderosa Pine (PPN) at lower elevations and drier slopes, and White Fir (WFR) and Red Fir (RFR) at higher elevations. Wet Meadow (WTM) and Montane Riparian (MRI) are found within the Sierran Mixed Conifer type. Blue Oak - Foothill Pine (BOP) and Mixed Chaparral (MCH) may adjoin this type at drier, and lower, elevations.

**Wildlife Considerations**. The mixed conifer forest supports some 355 species of animals (Verner and Boss 1980). Sensitive species inhabiting mixed conifer include spotted owl, fisher and pine marten. Endangered species include bald eagle and peregrine

falcon (Verner and Boss 1980). Variety in plant species composition provides diversity in food and cover. Black oak acorns, berries from a variety of shrubs (e.g., deerbrush), and a great number of grasses and forbs provide the forage resource essential for wildlife (Kosco and Bartolome 1983).

### Physical Setting

Soils supporting the Sierran mixed conifer habitat are varied, derived primarily from Mesozoic granitic, Paleozoic sedimentary and volcanic rocks, and Cenozoic volcanic rocks. Serpentine soils, found primarily in the northern mixed conifer zone, support a number of endemic plants. Soils are deep to shallow. Fissures and cracks in granitic parent material often support forest growth, even where soil development is shallow. Temperatures range from 24 to 58 C (40 to 96 F) in summer and 4 to 36 C (10 to 60 F) in winter and decrease with elevation (Major 1977). The growing season ranges between 90 and 330 days in the north with 40 to 200 frost-free days, and 180 to 365 days in the south with 180 frost-free days. Precipitation ranges from 76 to 229 cm (30 to 90 in) per year, from October to May, with increasing snowfall as elevation increases.

#### Distribution

The Sierran mixed conifer habitat generally forms a vegetation band ranging 770 to 1230 m (2500 to 4000 ft) in the north to 1230 to 3076 m (4000 to 10,000 ft) in the southern Sierra Nevada (Griffin and Critchfield 1972). The Sierra Nevada mixed conifer forest occupies between 1.8 to 3.2 million ha (4.5 to 7.8 million ac) in southern Oregon and California, dominating western middle elevation slopes of the Sierra Nevada. Disjunct populations of mixed conifer are found in the Peninsular, Transverse, and Coast ranges of California.

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White Fir Karen Shimamoto

## Vegetation

**Structure--** The White Fir (WFR) habitat is characterized by nearly monotypic evenaged overstory (Cheatham and Haller 1975, Paysen et al, 1980, Riegel 1982, Rundel et al. 1977). Overlapping crowns that cast deep shade are characteristic, although open stands are common (Cheatham and Haller 1975, Eyre 1980, Riegel 1982). Northern California specimens grow to about 70 m (230 ft) in height. Southern California specimens grow to about 30 m (100 ft) (Cheatham and Haller 1975). The understory may consist of sparsely scattered grasses, forbs, and shrubs, or white fir seedlings and saplings (Cheatham and Haller 1975, Eyre 1980, Paysen et al. 1980). However, on moist swales or drainage bottoms, herbaceous cover may approach 100 percent (Rundel et al. 1977). Downed material usually consists of logs, branches and needle litter (Cheatham and Haller 1975). Fire influences the white fir habitat by causing a mosaic of even-aged stands in different successional stages.

**Composition-**- Mature white fir stands, normally monotypic, with more than 80 percent occurring as white fir, are found throughout California; from the Klamath Mountains along the north coast to the south coast mountain ranges, and in interior ranges from the Warner Mountains in the Great Basin to the Clark, Kingston, and New York mountain ranges in interior southern California (Rundel et al. 1977, Parker and Matyas 1981).

Shade and downed woody material tend to inhibit understory species (Parker and Matyas 1981). In the Klamath Mountains, for example, canyon live oak and chinquapin are the predominant understory species and open stands usually include squawcarpet and barberry. Dense stands, however, have herbaceous species such as wake robin, vetch, and pipsissewa. Jeffrey pine is an associate in the Cascades and Warner mountain ranges, with Greenleaf manzanita and currant as understory shrubs. Tree associates change in the southern Sierra Nevada, where sugar pine, incense-cedar, and red fir are found. Pipsissewa, wintergreen, current, and snowplant are in the understory (Cheatham and Haller 1975). In the south coast range and south interior range, sugar pine and single-leaf pinyon occur as associates of white fir, most commonly on cool, north- and east-facing slopes, respectively. Rundel et al. (1977) describes white fir vegetative composition over elevational and moisture differences in the Sierra Nevada.

**Other Classifications**-- Historically, the white fir habitat has been described as part of the mixed conifer habitat (white fir phase) (Griffin 1967) or as ecotonal between mixed

conifer and red fir. Munz and Keck (1959) simply included it in yellow pine forest. White fir habitat is now named White Fir (Parker and Matyas 1981); White Fir (211) (Eyre 1980); White Fir Series (Paysen et al. 1980); White Fir Zone (Franklin and Dyrness 1973); Sierran White Fir (8.424) and Southern California White Fir (8.532) (Cheatham and Haller 1975); White Fir-Sugar Pine Forest (Thorne 1977).

### **Habitat Stages**

**Vegetation Changes--**1;2-5:S-D;6. Following disturbance, white fir proceeds through the seral stages (Gordon 1970,1973b, Eyre 1980, Conard 1980, Conard and Radosevich 1982, Hopkins 1982, Laacke and Fiske 1983). In the grass/forb stage, bare mineral soil provides the best seedbed for white fir. If the site has been burned, brush seedlings such as manzanita, snowbrush ceanothus, mountain whitethorn, deerbrush, willow, bittercherry, huckleberry oak, currant, gooseberry and chinquapin also become established.

In the shrub/sapling stage, large brush fields comprise 75 percent of the vegetative cover and persist for 30-50 years. Varying density of white fir seedlings (1000-10,000 stems per ha) establish within 10 to 20 years, growing under and eventually overtopping the brush. In managed situations, brush is removed and white fir growth increases by as much as 200 percent in height.

In the pole/medium tree stage, white fir overtops the shrubs which for the most part are shaded out and die. Sometimes an understory of white fir establishes by the time the overstory reaches pole height. This multilayered condition persists into later stages. In the large tree stage, a characteristic understory develops including whitevein shinleaf, little prince's pine, bracken fern, striped coralroot, and milk kelloggia primarily root parasites and semiparasitic species.

**Duration of Stages--** The duration of the grass/forb stage is dependent on the availability of a white fir seed source and a good seed crop every 3-9 years (Schopmeyer 1974, Gordon 1978). Reforestation activities would limit the duration of this seral stage to less than 5 years. In the shrub/sapling stage, white fir seedlings and saplings can persist for 30 to 50 years under a brush overstory. The average age in the large tree stage is 250 to 300 years with 70 to 90 cm (28-35 in) dbh (Hopkins 1979a, 1979b).

### **Biological Setting**

**Habitat--** In the Klamath Mountains, the Cascades, and the Sierra Nevada, white fir habitat occurs between mixed conifer and red fir habitats (Eyre 1980, Parker and Matyas 1981). In the south coast Transverse and Peninsular ranges, and in the mountain ranges of interior southern California, white fir intergrades at lower elevations with mixed conifer and is replaced at higher elevations by lodgepole pine (Cheatham and Haller 1975, Parker and Matyas 1981).

**Wildlife Considerations--** White fir habitat is probably the coolest, moistest, nonriparian habitat within the lower to mid-elevation forests in northern California. In southern California this habitat is colder and drier, probably equivalent to the red fir habitat elsewhere, but with drier conditions (Cheatham and Haller 1975).

As stands mature, a high percentage of defective trees are found, the result of windthrow and heart rot fungus (Gordon 1973, Hopkins 1982). Excellent habitat is provided for snag and cavity dependent wildlife species, particularly when breaks occur between 15-30 m (50-100 ft). The additional benefit of heart rot is the cylindrically stable snag created as a result of the rot moving from the inside of the tree to the outer diameter.

White fir is the preferred tree species for insect-gleaning yellow-rumped warblers and western tanagers, and is also commonly used by other insect-gleaning birds, such as mountain chickadee, chestnut-backed chickadee, golden-crowned kinglet, and blackheaded grosbeak (Airola and Barrett 1985).

## **Physical Setting**

White fir habitats are found on a variety of soils developed from different parent material, including volcanic and igneous rocks, granitics, various metamorphics, and sedimentary material (Franklin and Dyrness 1973, Fowells 1965, Hopkins 1982). Soils are coarse textured, well-drained, have poorly developed profiles, are often rocky, and are cold, with mean annual temperatures from 0 to 10 C (32 -50 F) (Cheatham and Haller 1975, Riegel 1982, Laacke and Fiske 1983a). Cooler north- and east-facing slopes are the most common sites throughout the state, however, Riegel (1982) noted the presence of unusually xeric white fir stands in the Warner Mountains. Precipitation is between 76-178 cm (30-70 in) mostly in the form of snow. Almost all precipitation falls between October and May (Laacke and Fiske 1983).

### Distribution

Elevation of white fir habitat varies with latitude. In the Klamath Mountains of Trinity and Siskiyou Counties, white fir is found from 1370 to 1680 m (4500-5500 fl); from 1520 to 1830 m (5000-6000 ft) in the Cascade and Warner Mountains; at about 1675 m (5500 ft) in the Southern Sierra Nevada; above 1800 m (6000 ft) throughout the Transverse and Peninsular Ranges; and between 1800 to 2135 m (6000-7000 ft) in the southern interior ranges (Cheatham and Haller 1975, Parker and Matyas 1981). Small relict stands are also found at 2300 to 2880 m (7500-9500 ft) in the Clark, Kingston, and New York Mountains in the Mojave Desert (Thorne 1977, Paysen et al. 1980).

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Red Fir

Reginald H. Barrett

## Vegetation

**Structure--** Stand structure is typified by even-aged (established within 20-year span) groups of trees that cover several to thousands of square meters. The cause of this pattern is probably a history of recurrent lightning fires, windthrows, and insect outbreaks acting to kill groups of trees (Oosting and Billings 1943, Vankat 1970, Kilgore 1971, 1973, Gordon 1973a, Rundel et al. 1977, Pitcher 1981). Natural regeneration occurs on the disturbed site following the next good cone crop. Young seedling stands are thinned by competition for soil moisture during summer (Gordon 1970, Ustin et al. 1984 (No Ustin et al. 1984 in Hab Lit Cite.)). Logging is becoming a more common source of disturbance, creating larger openings on average than historic disturbances (Chapel et al. 1983).

**Composition--** Mature red fir stands normally are monotypic, with very few other plant species in any layer. Heavy shade and a thick layer of duff tends to inhibit understory vegetation, especially in dense stands (Oosting and Billings 1943). To the north, in the Klamath Mountains, red fir gives way to noble fir (Griffin and Critchfield 1972).

**Other Classifications--** Because of its distinctiveness, references to the red fir type are unambiguous (Jensen 1947, Storer and Usinger 1963, Munz and Keck 1970(No Munz and Keck 1970 in Hab Lit Cite), Cheatham and Haller 1975, Küchler 1977, Matyas and Parker 1979, Eyre 1980, Holstein 1980).

### **Habitat Stages**

**Vegetation Changes--** 1;2-5:S-D. After disturbance typically logging or fire red fir vegetation on a site proceeds through 4 seral stages: grass/forb, shrub/sapling, pole/medium tree, and large tree (Oosting and Billings 1943, Vankat 1970, Gordon 1979 (No Gordon 1979 in Hab Lit Cite.),Rundel et al. 1977, Zieroth 1978, Pitcher 1981). The grass/forb stage occurs when red fir seedlings become established on mineral soil or shallow litter and require about 5 years to reach a height of 15 cm (6 in). Herbs, are often sparse due to competition for soil moisture on light soils. In the shrub/sapling stage, large brush fields may develop after hot wildfires and are dominated by Ceanothus or other shrub species for many years. The pole/medium tree stage produces dense stands of young red fir that grow slowly with little mortality for many years. In the large tree stage,

subdominant trees die and add to a growing layer of duff and downed woody material, and dominant trees continue to grow for several hundred years to heights of 40 m (130 ft). Old growth stands on poor sites in the Sagehen Creek drainage of Nevada County average about 400 years old. The understory of mature stands is limited to less than 5 percent cover of shade tolerant forbs (e.g., Chimaphila menziesii, Phyrola picta).

**Duration of Stages--** Seral patterns are defined here for both good and poor sites (Schumacher 1928; Dunning and Reineke 1933; Oosting and Billings 1943, Gordon 1970, 1973b, Rundel et al. 1977, Barrett and Salwasser 1982). The seral pattern on good sites includes 10 years in the grass/forb stage, 20 years in the shrub/seedling stage, 80 years in the pole/medium tree stage and 110 years in the large tree stage. The pattern on poor sites includes 20 years in the shrub/seedling stage, 100 years in the pole/medium tree stage and 250 years in the large tree stage. Hence the cumulative year totals are 200 from the good site and 400 from the poor site.

## **Biological Setting**

Habitat-- Red fir habitats occur on frigid soils of the higher mountains of northern California. At lower elevations red fir habitats intergrade with white fir-dominated mixed conifer stands on drier sites and with lodgepole pine-mountain meadow stands on moist sites. Small pockets of lodgepole pine also occur in wet sites scattered throughout large tracts of red fir. Similar inclusions of aspen may be found along riparian zones. Mountain meadows of various sizes, sometimes associated with small lakes, are also typical of red fir habitats. At higher elevations, red fir habitats include increasing numbers of mountain hemlock, western white pine, whitebark pine, and to a lesser extent, foxtail pine and limber pine. Noble fir is associated with red fir in the northwestern region of the State (Rundel et al. 1977).

Wildlife Considerations-- Red fir habitats throughout California provide food or cover for at least one season to a total of 169 wildlife species (8 amphibians, 4 reptiles, 104 birds including 15 waterbirds, and 53 mammals). Red fir habitats can be considered very important for 28 birds and 26 mammals. Of special note are goshawk (sensitive species); blue grouse (game species); great gray owl, red fox, pine marten, and wolverine (rare species). Several rare or endangered raptors use red fir habitats to a minor extent (Grinnell and Storer 1924, Sumner and Dixon 1953, Shelford 1963, Storer and Usinger 1963, Johnston 1970, (No Johnston 1970 in Hab Lit Cite.) Verner and Boss 1980)

# Physical Setting

Red fir habitats are found on frigid soils over a wide range of topography exclusive of very wet sites. Annual precipitation ranges from 1000 to 3000 mm (40 to 50 in) per year, primarily as snow that forms packs up to 5 m (15 ft) in winter. Summers are dry, limiting tree growth to seasonally available soil moisture (Rundel et al. 1977).

#### Distribution

Red fir is distributed in an elevational band from about 1800 to 2750 m (6000 to 9000 ft). It extends from northern Lake County northward through the North Coast Ranges and from Kern County northward through the Sierra Nevada into the Cascade Range of southwestern Oregon (Griffen and Critchfield 1972). Large expanses of nearly monotypic stands of red fir are common throughout its range. Logging of red fir is accelerating, consequently the amount of low seral stages will increase considerably in the future.

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